

Where do the Bugs go in winter?

by Matt Bowser

As you enjoy the warmth of your home this January and the apparent absence of mosquitoes, have you ever wondered what the bugs are up to or how they are getting along out there in the cold? They lack the ability to make warm shelter as we do, and they are much too small to generate much heat and hold it in as birds and mammals do. Insects and other cold-blooded, minute animals make it through the long, cold winter in either of two ways: avoidance of cold or physiological adaptations to cope with the cold.

Some invertebrates are able to find warm places to spend the winter, such as streams, mammal nests and human houses. Most aquatic insects avoid freezing by spending the winter in water bodies where only the surface freezes. Many of them are active all winter under the ice. Lice, fleas, and ticks enjoy the privilege of snuggling up to their warm-blooded hosts during the cold months, where they can regulate their body temperatures by moving to colder or warmer parts of their host. Most of us are familiar with the surge of spiders, daddy long-legs, ladybird beetles, and others that filter into our homes in the fall as the frosts begin. These little invaders are seeking a warm, snug nook to hide in. Many of them, such as the ladybird beetles, are really not adapted well to living in human dwellings and usually die before spring. Some spiders and daddy long-legs, though, may be quite contentedly residing in your crawl space even now.

The majority of bugs do not have the luxury of a warm home and must somehow endure the long, cold, dry Alaskan winter. Many burrow into the soil where, insulated by a layer of snow, temperatures are milder and more consistent than the outside air, but they still must withstand sustained sub-freezing temperatures. Invertebrates cope with sub-freezing temperatures either by supercooling, where body fluids remain liquid below the freezing point of water or by freeze tolerance, where body fluids freeze without causing death.

As temperatures drop, those that supercool produce substances in their body fluids that act as antifreeze so that they can resist freezing, even at very low temperatures. Most of the members yellow jacket (“hornet”) nests die in the fall, but young queens leave to seek out a cozy place to nestle in forest leaf lit-

ter. As the nights become cooler, their bodies increase the concentrations of solutes in their body fluids, increasing their resistance to freezing. Under an insulating layer of snow, where temperatures are warmer and much more stable than the air temperatures yellow jackets can endure winter temperatures down to about 3° F before they freeze. Birch bugs, spruce bark beetles, and many other insects supercool similarly. If temperatures continue to drop, though, these supercooling critters will freeze and die. This is why extremely cold winters, especially when there is little snow cover, may significantly reduce some insect populations.

Some of the hardiest insects can actually withstand freezing of most of their body fluids. Our largest and most conspicuous darkling beetle, *Upis ceramoides*, lives under bark of dead hardwoods, where it presumably eats fungi. These beetles find small nooks under tree bark in which to spend the winter. As it gets colder, they produce substances that actually encourage the formation of ice crystals in their body fluids so that they freeze at relatively high temperatures. Most of their body fluids freeze solid, reducing their metabolism to almost nothing. In this way they can endure extreme cold. Repeated cycles of freezing and thawing, though, can be hard on freeze-tolerant insects.

A few of our littlest animals not only supercool, but even remain active in winter. Some springtails (a group of tiny insect-like animals) are busy much of the winter foraging on fungi in the soil and on tree bark. The dusky firefly, a common beetle here, is active in winter in Massachusetts, where it spends the winter out on the bark of trees, but its wintering habits in Alaska are unknown.

As with the dusky firefly, the winter doings of many insects are not well understood in Alaska, so the next time you find yourself wondering what the bugs are doing while the world outside is crystalline and quiet, poke around in your crawl space, peek under the ice in a creek, break open a log, or sift through some leaf litter. You will find little critters dealing with the winter in one way or another and you may just find out something new.

Matt Bowser is a seasonal biological technician at the Kenai National Wildlife Refuge. Previous Refuge

Notebook columns can be viewed on the Web at <http://www.fws.gov/refuge/kenai/>.